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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/563,177	04/25/2006	Sebastian Kozerke	7665-0003WOUS	3772
35301 7590 06/04/2007 MCCORMICK, PAULDING & HUBER LLP CITY PLACE II 185 ASYLUM STREET HARTFORD, CT 06103			EXAMINER VARGAS, DIXOMARA	
			ART UNIT 2859	PAPER NUMBER
			MAIL DATE 06/04/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/563,177	Applicant(s) KOZERKE ET AL.	
	Examiner Dixomara Vargas	Art Unit 2859	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 March 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1,2,4-13 and 15 is/are rejected.
- 7) ☐ Claim(s) 3 and 14 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 December 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>03/05/07</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-2, 5-7, 9, 11-13 and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Bernd et al. ("Single-Breath hold 3D-TrueFISP Cine Cardiac Imaging").

With respect to claim 1, Bernd discloses a magnetic resonance imaging method to produce successive magnetic resonance images of a region of a subject comprising the steps of (Abstract): exposing the body of a subject to a uniform magnetic field, obtaining a series of successive magnetic resonance signals of the region of the subject by steady-state free precession imaging (Page 922, second paragraph of "Implementation and Experiments"), acquiring successive sets of the magnetic resonance signals in the series (Page 922, second paragraph of "Implementation and Experiments") by successively scanning respective sets of points in k-space in an undersampled fashion (Page 924, third paragraph of "Discussion and Conclusion"), the step of acquiring including employing an eddy-current reduction technique (Page 922, first paragraph of "Implementations and Experiments"), and reconstructing successive magnetic resonance images of the region from the successive sets of magnetic resonance signals using a suitable reconstruction method (Page 923, last paragraph of "Results").

Art Unit: 2859

3. With respect to claim 2, Bernd discloses the step wherein the eddy-current reduction technique employs alternating sweep directions in sampling k-space (Page 922, first paragraph of “Implementation and experiments”).

4. With respect to claim 5, Bernd discloses the step of reconstructing successive magnetic resonance images from the respective sets of undersampled magnetic resonance signals including utilizing a reduced field of view, where changes in image contents are assumed to take place (Page 922, second paragraph of “Implementation and experiments” and Page 923, fourth paragraph of “Results”).

5. With respect to claim 6, Bernd discloses the step wherein an elliptical k-space shutter is applied (Page 922, second paragraph of “Implementation and experiments”; Figure 1).

6. With respect to claim 7, Bernd discloses the step wherein navigator-based volume tracking is applied (Page 922, second paragraph of “Implementation and experiments”; Figure 1).

7. With respect to claim 9, Bernd discloses a computer application stored on a computer-readable medium for producing successive magnetic resonance images of a region of a subject, the computer application comprising executable instructions to (Abstract): obtain a series of subsequent magnetic resonance signals of a region of a subject by steady-state free precession imaging (Page 922, second paragraph of “Implementation and Experiments”), apply an eddy-current reduction technique (Page 922, first paragraph of “Implementations and Experiments”), such as by alternating the sweep directions of sampling in k-space (Page 922, first paragraph of “Implementation and experiments”), acquire a set of magnetic resonance signals in an undersampled fashion (Page 924, third paragraph of “Discussion and Conclusion”), and

Art Unit: 2859

reconstruct successive magnetic images of the region from the successive sets of magnetic resonance signals (Page 923, last paragraph of “Results”).

8. With respect to claim 11, Bernd discloses the step of obtaining successive updates of a training set of magnetic resonance signals from the magnetic resonance signals (Page 922, second paragraph of “Implementations and Experiments”), by further acquisition of a central portion of k-space at full sampling density (Page 923, see “Results”).

9. With respect to claim 12, Bernd discloses the step of reconstructing a baseline image from one of the undersampled signals, the training set of signals, and data acquired separately during periods with little or no motion (Page 924, third paragraph of “Discussion and Conclusion”).

10. With respect to claim 13, Bernd discloses the step of reconstructing the successive magnetic resonance images from the magnetic resonance signals based in part on the baseline image (Page 922, see “Implementations and Experiments”).

11. With respect to claim 15, Bernd discloses the step wherein the instructions for reconstructing the successive magnetic images of the region from the successive sets of magnetic resonance signals include utilizing a reduced field of view where changes in image content are assumed to take place (Page 922, second paragraph of “Implementation and experiments” and Page 923, fourth paragraph of “Results”).

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

14. Claims 4, 8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bernd et al. ("Single-Breath hold 3D-TrueFISP Cine Cardiac Imaging") in view of Takizawa et al. (US 6,876,201 B2).

With respect to claim 4, Bernd discloses the claimed invention as stated above in paragraph 2 except for the step of employing a receiver antennae system having a spatial sensitivity profile, and the step of reconstructing including reconstructing successive magnetic resonance images from the respective sets of undersampled magnetic resonance signals on the basis of the sensitivity profile of the receiver antennae. However, Takizawa discloses the step of employing a receiver antennae system having a spatial sensitivity profile, and the step of reconstructing including reconstructing successive magnetic resonance images from the respective sets of undersampled magnetic resonance signals on the basis of the sensitivity profile of the receiver antennae (Abstract; Column 11, lines 1-13). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to employ a

Art Unit: 2859

receiver antennae system having a spatial sensitivity profile to perform the step of reconstruction including reconstructing successive magnetic resonance images from the respective sets of undersampled magnetic resonance signals on the basis of the sensitivity profile of the receiver antennae as taught by Takizawa with Bernd's MRI method to produce successive MR images of a region of a subject for the purpose of correcting any aliasing artifacts.

15. With respect to claim 8, Bernd discloses a magnetic resonance imaging method for producing successive magnetic images of a region of a static subject comprising the steps of (Abstract): exposing the body of a subject to a uniform magnetic field, obtaining a series of successive magnetic resonance signals by steady-state free precession imaging of a region of the subject (Page 922, second paragraph of "Implementation and Experiments"), acquiring a set of magnetic resonance signals (Page 922, second paragraph of "Implementation and Experiments") in an undersampled fashion by successively scanning respective sets of points in k-space (Page 924, third paragraph of "Discussion and Conclusion"), including applying an eddy-current reduction technique (Page 922, first paragraph of "Implementations and Experiments"), such as by alternating the sweep directions of sampling in k-space (Page 922, first paragraph of "Implementation and experiments"), reconstructing the successive magnetic resonance images from the respective sets of magnetic resonance signals of the dynamic series including at least one of the steps of (Page 923, last paragraph of "Results"): identifying a distribution of likelihood of changes in the successive magnetic resonance images from a baseline image, basing the reconstructing of successive magnetic resonance images in part on the sensitivity profile of the receiver antennae, and including utilizing a reduced field of view, where changes in image contents are assumed to take place (Page 922, second paragraph of "Implementation and

experiments” and Page 923, fourth paragraph of “Results” disclosing the step of utilizing a reduced field of view).

Furthermore, Bernd discloses the claimed invention as stated above except for the step of employing a receiver antennae system having a spatial sensitivity profile, and the step of acquiring the magnetic resonance signals by way of a receiver antennae system having a spatial sensitivity profile. However, Takizawa discloses the step of acquiring the magnetic resonance signals by way of a receiver antennae system having a spatial sensitivity profile (Abstract; Column 11, lines 1-13). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to acquire the magnetic resonance signals by way of a receiver antennae system having a spatial sensitivity profile as taught by Takizawa with Bernd’s MRI method to produce successive MR images of a region of a subject for the purpose of correcting any aliasing artifacts.

16. With respect to claim 10, Bernd discloses the claimed invention as stated above in paragraph 7 except for the step wherein the magnetic resonance signals are acquired using a receiver antennae system having a spatial sensitivity profile. However, Takizawa discloses the step wherein the magnetic resonance signals are acquired using a receiver antennae system having a spatial sensitivity profile (Abstract; Column 11, lines 1-13). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to acquire the magnetic resonance signals by way of a receiver antennae system having a spatial sensitivity profile as taught by Takizawa with Bernd’s MRI method to produce successive MR images of a region of a subject for the purpose of correcting any aliasing artifacts.

Allowable Subject Matter

17. Claims 3 and 14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

18. The following is a statement of reasons for the indication of allowable subject matter:

a. With respect to claim 3, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a magnetic resonance imaging method to produce successive magnetic resonance images of a region of a subject comprising the steps wherein the step of acquiring the successive sets of magnetic resonance signals including successively scanning respective sets of points in k-space in an undersampled fashion such that the ensemble of successive sets cover the entire portion of k-space at full sampling density, obtaining successive updates of a training set of magnetic resonance signals from the magnetic resonance signals by further acquisition of a central portion of k-space at full sampling density, updating the undersampled sets of magnetic resonance signals using further undersampled scans of the entire k-space, reconstructing a baseline image from the training data, identifying a distribution of a likelihood of changes in the successive magnetic resonance images from the training data, in the space spanned by geometrical space, reconstructing successive magnetic resonance images from the respective sets of undersampled magnetic resonance signals on the basis of the identified distribution of likelihood of changes, and wherein the step of acquiring including acquiring the magnetic resonance signals by way of a receiver antennae system having a spatial sensitivity profile, and the step of reconstructing further

including reconstructing the successive magnetic resonance images from the respective sets of undersampled magnetic resonance signals based in part on the sensitivity profile of the receiver antennae in combination with the remaining limitations of the claim 1 above.

b. With respect to claim 14, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a computer application stored on a computer-readable medium for producing successive magnetic resonance images of a region of a subject, the computer application comprising executable instructions to perform the step of identifying a distribution of a likelihood of changes in the successive magnetic resonance images from the training set in the space spanned by geometrical space or geometrical space and temporal frequency wherein the instructions for reconstructing the successive magnetic images of the region from the successive sets of magnetic resonance signals are based in part on the distribution of likelihood of changes in combination with the remaining limitations of the claim 9 above.

Response to Arguments

19. Applicant's arguments with respect to claims 1-15 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

20. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The additional prior art cited in the PTO 892 discloses MR systems that utilize

Art Unit: 2859

undersampling methods that produce eddy current compensation and MR methods that that utilizes undersampling methods in conjunction with SSFP methods.

21. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dixomara Vargas whose telephone number is (571) 272-2252. The examiner can normally be reached on Monday to Thursday from 8:00 am. to 4:30 pm..

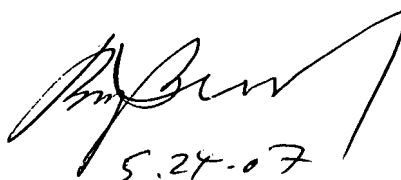
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez can be reached on (571) 272-2245. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2859

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Dixomara Vargas
Patent Examiner
Art Unit 2859


5.24.07

BRIJ SHRIVASTAV
PRIMARY EXAMINER